WE CLAIM:

1. A composite medical device produced by a process comprising:

constructing a composite elongate shaft by forming a metallic outer portion comprising a first metallic material about a metallic inner portion including a lumen therein, the metallic inner portion comprising a second metallic material different from the first material, wherein the second metallic material is more flexible than the first metallic material, and wherein the composite elongate shaft has a distal region and a proximal region; and

removing a segment of the metallic outer portion from the composite shaft to expose a segment of the metallic inner portion.

2. The composite medical device of claim 1, wherein removing the segment of the metallic outer portion from the composite shaft to expose the segment of the metallic inner portion includes removing the segment of the metallic outer portion from the composite shaft in the distal region of the composite elongate shaft.

3. The composite medical device of claim 1, also including allowing a second segment of the metallic outer portion of the composite shaft to remain disposed about a second segment of the inner portion of the composite shaft.

4. The composite medical device of claim 3, wherein allowing the second segment of the metallic outer portion of the composite shaft to remain disposed about the second segment of the inner portion of the composite shaft includes allowing the second segment of the metallic outer portion of the composite shaft to remain disposed about the second segment of the inner portion in the proximal region of the composite elongate shaft.

5. The composite medical device of claim 1, wherein the segment of the metallic outer portion removed from the distal region of the shaft to expose the segment of the metallic inner portion, and also including allowing a second segment of the

metallic outer portion of the composite shaft to remain disposed about a second segment of the inner portion at the distal region of the shaft.

6. The composite medical device of claim 1, wherein constructing the composite elongate shaft comprises co-drawing the metallic inner portion with the metallic outer portion to form the composite shaft.

7. The composite medical device of claim 1, wherein constructing the composite elongate shaft comprises co-extruding the metallic inner portion with the metallic outer portion to form the composite shaft.

8. The composite medical device of claim 1, wherein removing a segment of the metallic outer portion includes providing a tapered transition between a region in which the metallic outer portion is intact and a region in which the metallic outer portion has been removed.

9. The composite medical device of claim 1, wherein removing a segment of the metallic outer portion comprises grinding a segment of the metallic outer portion from the composite shaft to expose a segment of the metallic inner portion.

10. The composite medical device of claim 1, wherein removing a segment of the metallic outer portion comprises etching a segment of the metallic outer portion from the composite shaft to expose a segment of the metallic inner portion.

11. The composite medical device of claim 1, wherein the metallic inner portion comprises a nickel-titanium alloy.

12. The composite medical device of claim 1, wherein the metallic inner portion comprises beta titanium.

13. The composite medical device of claim 1, wherein the metallic inner portion comprises a super-elastic nickel-titanium alloy.

14. The composite medical device of claim 1, wherein the metallic inner portion comprises a linear-elastic nickel-titanium alloy.

15. The composite medical device of claim 1, wherein the metallic inner portion comprises a hollow tube having a length, and the lumen extends along the entire length.

16. The composite medical device of claim 1, wherein the metallic outer portion comprises stainless steel, cobalt alloy, Elgiloy, MP35N, tantalum, tungsten, or refractory metal.

17. The composite medical device of claim 12, wherein the metallic outer portion comprises stainless steel, cobalt alloy, Elgiloy, MP35N, tantalum, tungsten, or refractory metal.

18. The composite medical device of claim 1, wherein the composite medical device comprises a catheter.

19. The composite medical device of claim 1, wherein the composite medical device comprises a guide catheter.

20. The composite medical device of claim 1, wherein removing a segment of the metallic outer portion comprises grinding a segment of the metallic outer portion from a segment of the metallic inner portion, and the process further includes grinding a segment of the metallic inner portion to form a reduced outer diameter region on the metallic inner portion.

21. The composite medical device of claim 20, wherein the reduced diameter region of the metallic inner portion comprises a tapered portion.

22. The composite medical device of claim 1, wherein removing the segment of the metallic outer portion includes selectively removing part of the first metallic material to form a pattern of the first metallic material that remains on the shaft.

23. The composite medical device of claim 22, wherein the pattern is in the form of a helix or spiral along the length of a portion of the shaft.

24. The composite medical device of claim 22, wherein the pattern is in the form of a series of cells, squares, ovals, rectangles, triangles or circles along the length of a portion of the shaft.

25. The composite medical device of claim 1, wherein the composite medical device comprises a hypo-tube catheter, a drug delivery catheter, a therapeutic catheter, a diagnostic catheter or a guide catheter.

26. The composite medical device of claim 1, wherein the metallic material of the inner portion has a modulus of elasticity that is less than the modulus of elasticity of the metallic material of the outer portion.

27. The composite medical device of claim 1, wherein the metallic material of the outer portion has higher tortional rigidity than the metallic material of the inner portion.

28. A method of making a composite medical device, the method comprising:

constructing a composite elongate shaft by forming a metallic outer portion comprising a first metallic material about a metallic inner portion including a lumen defined therein, the metallic inner portion comprising a second metallic material different from the first material, wherein the second metallic material is more flexible than the first

metallic material, and wherein the composite elongate shaft has a distal region and a proximal region; and

removing a segment of the metallic outer portion from the composite shaft to expose a segment of the metallic inner portion.

29. The method of claim 28, wherein removing the segment of the metallic outer portion from the composite shaft to expose the segment of the metallic inner portion includes removing the segment of the metallic outer portion from the composite shaft in the distal region of the composite elongate shaft.

30. The method of claim 28, also including allowing a second segment of the metallic outer portion of the composite shaft to remain disposed about a second segment of the inner portion of the composite shaft.

31. The method of claim 30, wherein allowing the second segment of the metallic outer portion of the composite shaft to remain disposed about the second segment of the inner portion of the composite shaft includes allowing the second segment of the metallic outer portion of the composite shaft to remain disposed about the second segment of the inner portion in the proximal region of the composite elongate shaft.

32. The method of claim 28, wherein the segment of the metallic outer portion removed from the distal region of the shaft to expose the segment of the metallic inner portion, and also including allowing a second segment of the metallic outer portion of the composite shaft to remain disposed about a second segment of the inner portion at the distal region of the shaft.

33. The method of claim 28, wherein constructing the composite elongate shaft comprises co-drawing the metallic inner portion with the metallic outer portion to form the composite shaft.

34. The method of claim 28, wherein constructing the composite elongate shaft comprises co-extruding the metallic inner portion with the metallic outer portion to form the composite shaft.

35. The method of claim 28, wherein removing a segment of the metallic outer portion includes providing a tapered transition between a region in which the metallic outer portion is intact and a region in which the metallic outer portion has been removed.

36. The method of claim 28, wherein removing a segment of the metallic outer portion comprises grinding a segment of the metallic outer portion from the composite shaft to expose a segment of the metallic inner portion.

37. The method of claim 28, wherein removing a segment of the metallic outer portion comprises etching a segment of the metallic outer portion from the composite shaft to expose a segment of the metallic inner portion.

38. The method of claim 28, wherein the metallic inner portion comprises a nickel-titanium alloy.

39. The method of claim 28, wherein the metallic inner portion comprises beta titanium.

40. The method of claim 28, wherein the metallic inner portion comprises a super-elastic nickel-titanium alloy.

41. The method of claim 28, wherein the metallic inner portion comprises a linear-elastic nickel-titanium alloy.

42. The method of claim 28, wherein the metallic inner portion comprises a hollow tube having a length, and the lumen extends along the entire length.

43. The method of claim 28, wherein the metallic outer portion comprises stainless steel, cobalt alloy, Elgiloy, MP35N, tantalum, tungsten, or refractory metals.

44. The method of claim 39, wherein the metallic outer portion comprises stainless steel, cobalt alloy, Elgiloy, MP35N, tantalum, tungsten, or refractory metals.

45. The method of claim 28, wherein the composite medical device comprises a catheter.

46. The method of claim 28, wherein the composite medical device comprises a guide catheter.

47. The method of claim 28, wherein removing a segment of the metallic outer portion comprises grinding a segment of the metallic outer portion from a segment of the metallic inner portion, and the process further includes grinding a segment of the metallic inner portion to form a reduced outer diameter region on the metallic inner portion.

48. The method of claim 47, wherein the reduced diameter region of the metallic inner portion comprises a tapered portion.

49. The method of claim 28, wherein the composite medical device comprises a hypo-tube catheter, a drug delivery catheter, a therapeutic catheter, a diagnostic catheter or a guide catheter.

50. The method of claim 28, wherein the metallic material of the inner portion has a modulus of elasticity that is less than the modulus of elasticity of the metallic material of the outer portion.

51. The method of claim 28, wherein the metallic material of the outer portion has higher tortional rigidity than the metallic material of the inner portion.

52. The method of claim 28, wherein removing the segment of metallic outer portion includes selectively removing the segment of the first metallic material while leaving a second segment of the first metallic material on the composite shaft in a pattern.

53. Te method of claim 52, wherein the second segment of the first metallic material that remains on the composite shaft is in the form of a helix or spiral along the length of a portion of the shaft.

54. The method of claim 52, wherein the pattern is in the form of a series of cells, squares, rectangles, ovals, or circles along the length of a portion of the shaft.

55. A method of making a composite medical device, the method comprising:

providing a composite elongate shaft including a metallic outer portion comprising a first metallic material formed about a metallic inner portion including a lumen defined therein, the metallic inner portion comprising a second metallic material different from the first material, wherein the second metallic material is more flexible than the first metallic material, and wherein the composite elongate shaft has a distal region and a proximal region;

providing means for imparting the distal region with a higher level of flexibility relative to the proximal region; and

imparting the distal region with a higher level of flexibility relative to the proximal region.

56. The method of claim 55, further including providing means for imparting the proximal region with a higher level of stiffness relative to the distal region, and imparting the proximal region with a higher level of stiffness relative to the distal region.

57. A composite medical device comprising:

a composite elongate shaft including a metallic outer portion comprising a first metallic material formed about a metallic inner portion including a lumen defined therein, the metallic inner portion comprising a second metallic material different from the first material, wherein the second metallic material is more flexible than the first metallic material, and wherein the composite elongate shaft has a distal region and a proximal region; and

the distal region of the shaft has a segment of the metallic outer portion removed from the composite shaft to expose a segment of the metallic inner portion, wherein the distal region of the shaft is more flexible than the proximal region of the shaft.

58. The composite medical device of claim 57, wherein the composite elongate shaft is a co-drawn or co-extruded shaft.

59. The composite medical device of claim 57, wherein the metallic inner portion comprises a nickel-titanium alloy.

60. The composite medical device of claim 57, wherein the metallic inner portion comprises beta titanium.

61. The composite medical device of claim 57, wherein the metallic inner portion comprises a super-elastic nickel-titanium alloy.

62. The composite medical device of claim 57, wherein the metallic inner portion comprises a linear-elastic nickel-titanium alloy.

63. The composite medical device of claim 57, wherein the metallic inner portion comprises a hollow tube having a length, the lumen extending along the entire length.

64. The composite medical device of claim 57, wherein the metallic outer portion comprises stainless steel, cobalt alloy, Elgiloy, MP35N, tantalum, tungsten, or refractory metal.

65. The composite medical device of claim 60, wherein the metallic outer portion comprises stainless steel, cobalt alloy, Elgiloy, MP35N, tantalum, tungsten or refractory metal.

66. The composite medical device of claim 57, wherein the composite medical device comprises a catheter.

67. The composite medical device of claim 57, wherein the composite medical device comprises a guide catheter.

68. The composite medical device of claim 57, wherein the metallic material of the inner portion has a modulus of elasticity that is less than the modulus of elasticity of the metallic material of the outer portion.

69. The composite medical device of claim 57, wherein the metallic material of the outer portion has higher tortional rigidity than the metallic material of the inner portion.

70. The composite medical device of claim 57, wherein the distal region of the shaft having the segment of the metallic outer portion removed from the composite shaft also includes a second segment of the metallic outer portion that remains on the composite shaft in a pattern.

71. The composite medical device of claim 70, wherein the second segment of the metallic outer portion that remains on the composite shaft is in the shape of a spiral or helix along the length of a portion of the shaft.

72. The composite medical device of claim 70, wherein the pattern is in the shape of a series of cells, squares, rectangles, ovals or circles along the length of a portion of the shaft.

73. A composite medical device comprising:

a composite elongate shaft including a metallic outer portion comprising a first metallic material formed about a metallic inner portion including a lumen defined therein, the metallic inner portion comprising a second metallic material different from the first material, wherein the second metallic material is more flexible than the first metallic material, and wherein the composite elongate shaft has a distal region and a proximal region;

means for providing the distal region with a higher level of flexibility relative to the proximal region; and

means for providing the proximal region with a higher level of stiffness relative to the distal region.